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ANISOTROPIC SATELLITE INFALL IN A ΛCDM UNIVERSE

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We use a dark matter only simulation to study the accretion of satellites in the ΛCDM model. We analyse the radial velocity profiles of identified satellites as a function of their distance to the host halo and the dependence on its principal inertia axes.

We investigate the anisotropy of satellite infall using a dark matter only simulation, developed at *IATE, CONICET-UNC*. We follow the evolution of 1024^3 particles in a periodic box of $1000\,h^{-1}$Mpc side with WMAP9 cosmological parameters. The particle mass resolution is $7.2118 \times 10^{10}\,h^{-1}\,M_\odot$ and the force resolution $30\,h^{-1}$kpc. The halo identification and merger trees were constructed using *Rockstar* (Behroozi et al. 2013).

We shall refer from now on to *hosts* or *primary haloes*, to those haloes more massive than $M_{\rm vir} = 10^{13}h^{-1}M_\odot$ surrounded within $3\,r_{\rm vir}$ by companions whose masses are at most, half the mass of the primary. This isolation criterion guarantees that the host is the dominant object in the neighbourhood and rules the local dynamics. We classify as *satellite haloes*, all those objects that are within $3\,r_{\rm vir}$ of the previously identified hosts. Our final sample consists of 692, 325 satellites surrounding 220, 123 hosts.

We compute the three principal inertia axes of each host halo and calculate the projection of the relative velocity of the satellites onto these axes. We normalize positions and velocities in units of the host virial quantities. This normalization allowed us to stack all the hosts in our sample in order to obtain statistically relevant results. We compute the distribution of the velocity projections in the phase–space $V/V_{\rm vir} - r/r_{\rm vir}$ separating the regions with mean positive and negative radial velocities. Figure 1 shows the result of subtracting bin by bin in distance and velocity modulus the positive minus the negative counts. We show separately the major and minor inertia axes cases along with curves of radial velocity distribution (mean, median, 25% and 75% percentiles).

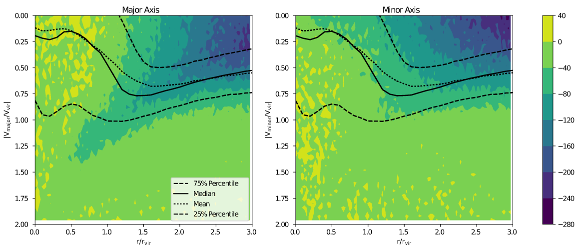

Fig. 1. 2D satellite velocity excess distribution as a function of distance to the host halo, both scaled to the virial parameters of the host. The left and right panel show the projection of the total velocity along the major and minor axis of inertia of the host halo, respectively.

As it can observed, both panels of Figure 1 show an excess of infalling satellites present in distances greater than the virial radius of the primary halo. Nevertheless, the excess along the major axis can be noticed even at small distances ($r/r_{\rm vir} \sim 0.5$). In the minor axis case, the excess of satellites in the process of accretion is more diffuse, with a predominant population of low velocity satellites ($V_{\rm minor}/V_{\rm vir} < 1$). Besides, we find signals of outflowing satellites at given velocities along the major axis, whereas along the minor axis direction this excess is not present.

The anisotropic infall pattern found in our work relates host shape and accretion process, accounting for the triaxial nature of halos and their inhomogeneous assembling.

Our results show how halo shapes and large–scale structure can have important influence on the evolution of primaries and their internal properties through satellite accretion.

REFERENCES

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